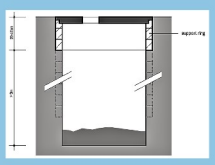
Single Pit

العربية (/ar/sanitation-systems/sanitation-technologies/single-pit)

Applicable to	Application level	Management level	Inputs	Outputs
System 1 (/humanitarian-crises/rural-settings/sanitation/sanitation-systems/system-1%3A-single-pit-system)	City Household Neighborhood	Household Public Shared	Faeces, Excreta, Blackwater, + Dry Cleansing Materials, + Anal Cleansing Water	Sludge



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Adapted from

Compendium of Sanitation Systems and Technologies. 2nd Revised Edition (/node/5587)

Executive Summary

The single pit is one of the most widely used sanitation technologies. Excreta, along with anal cleansing materials (water or solids) are deposited into a pit. Lining the pit prevents it from collapsing and provides support to the superstructure.

Advantages

- Can be built and repaired with locally available materials

Disadvantages

- Flies and odours are normally noticeable

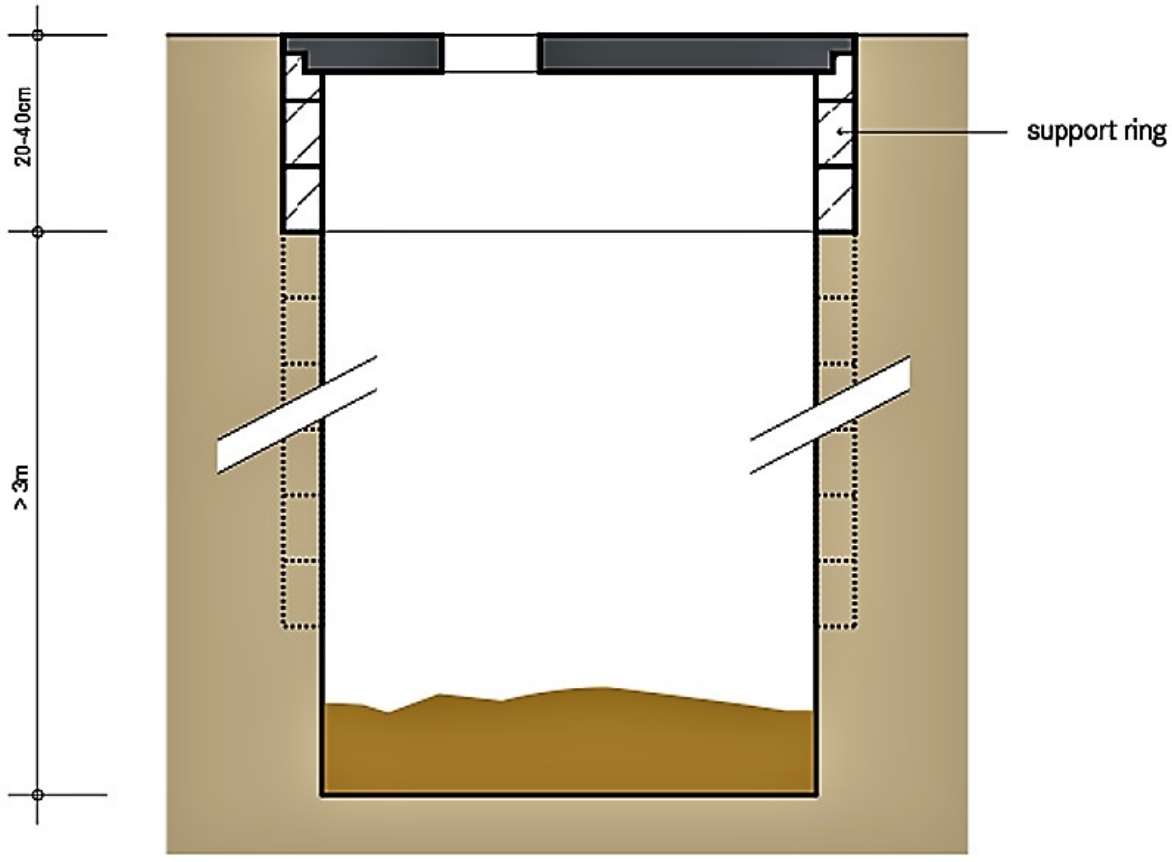
- Low (but variable) capital costs depending on materials and pit depth
- Small land area required
- Low reduction in BOD and pathogens with possible contamination of groundwater
- Costs to empty may be significant compared to capital costs
- Sludge requires secondary treatment and/or appropriate discharge

In	Out
Urine or Yellowwater, Faeces, Excreta, Dry Cleansing Materials, Anal Cleansing Water, Blackwater	Faecal Sludge

Introduction

As the single pit fills, two processes limit the rate of accumulation: leaching and degradation. Urine and water percolate into the soil through the bottom of the pit and wall, while microbial action degrades part of the organic fraction.

There is no daily maintenance associated with a single pit apart from keeping the facility clean. However, when the pit is full it can be a) pumped out and reused or b) the superstructure and squatting plate can be moved to a new pit and the previous pit covered and decommissioned, which is only advisable if plenty of land area is available.



Schematic of a single pit. Source: TILLEY et al. (2014)

Design Considerations

On average, solids accumulate at a rate of 40 to 60 L per person/year and up to 90 L per person/year if dry cleansing materials such as leaves or paper are used. The volume of the pit should be designed to contain at least 1,000 L. Typically, the pit is at least 3 m deep and 1 m in diameter. If the pit diameter exceeds 1.5 m, there is an increased risk of collapse. Depending on how deep they are dug, some pits may last 20 or more years without emptying. To prevent groundwater contamination, the bottom of the pit should be at least 2 m above groundwater level (rule of thumb). If the pit is to be reused, it should be lined. Pit lining materials can include brick, rot-resistant timber, concrete, stones, or mortar plastered onto the soil. If the soil is stable (i.e., no presence of sand or gravel deposits or loose organic materials), the whole pit need not be lined. The bottom of the pit should remain unlined to allow for the infiltration of liquids out of the pit.

As liquid leaches from the pit and migrates through the unsaturated soil matrix, pathogenic germs are sorbed to the soil surface. In this way, pathogens can be removed prior to contact with groundwater. The degree of removal varies with soil type, distance travelled, moisture and other environmental factors and, thus, it is difficult to estimate the distance necessary between a pit and a water source. A minimum horizontal distance of 30 m is normally recommended to limit exposure to microbial contamination.

When it is not possible to dig a deep pit or the groundwater level is too high, a raised pit can be a viable alternative: the shallow pit can be extended by building the pit upwards with the use of concrete rings or blocks. A raised pit can also be constructed in an area where flooding is frequent in order to keep water from flowing into the pit during heavy rain. Another variation is the unlined shallow pit that may be appropriate for areas where digging is difficult. When the shallow pit is full, it can be covered with leaves and soil, and a small tree can be planted (see **Arborloo (/factsheet/arborloo)**).

A ventilated improved pit (**VIP (/factsheet/single-ventilated-improved-pit-%28vip%29)**) is slightly more expensive than a single pit, but greatly reduces the nuisance of flies and odours, while increasing comfort.

If a urine-diverting user interface is used, only faeces are collected in the pit and leaching can be minimized.

Health Aspects/Acceptance

A single pit is an improvement to open defecation; however, it still poses health risks:

- Leachate can contaminate groundwater;
- Stagnant water in pits may promote insect breeding;
- Pits are susceptible to failure and/or overflowing during floods.

Single pits should be constructed at an appropriate distance from homes to minimize fly and odour nuisances and to ensure convenience and safety.

Operation and Maintenance

There is no daily maintenance associated with a single pit apart from keeping the facility clean. However, when the pit is full it can be a) pumped out and reused or b) the superstructure and squatting plate can be moved to a new pit and the previous pit covered and decommissioned, which is only advisable if plenty of land area is available.

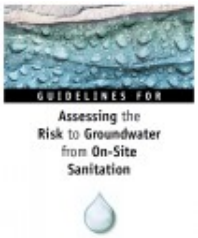
Applicability

Treatment processes in a single pit (aerobic, anaerobic, dehydration, composting or otherwise) are limited and, therefore, pathogen reduction and organic degradation is not significant. However, since the excreta are contained, pathogen transmission to the user is limited.

Single pits are appropriate for rural and peri-urban areas; in densely populated areas they are often difficult to empty and/or have insufficient space for infiltration. Single pits are especially appropriate when water is scarce and where there is a low groundwater table.They are not suited for rocky or compacted soils (that are difficult to dig), or for areas that flood frequently.

Library References

Guidelines for Assessing the Risk to Groundwater from On-Site Sanitation



Many people in developing countries rely upon untreated groundwater supplies for their drinking water (e.g. from drilled boreholes, tube wells, dug wells or springs). The introduction of on-site sanitation systems might lead to groundwater contamination. The purpose of this manual is to provide guidance on how to assess and reduce the risk of contamination of groundwater supplies from on-site sanitation systems and is aimed at those responsible for planning low cost water supply and sanitation schemes.

ARGOSS (2001): Guidelines for Assessing the Risk to Groundwater from On-Site Sanitation. (= Commissioned Report , 142). Keyworth: British Geological Survey **URL (https://www.gov.uk/dfid-research-outputs/argoss-2001-guidelines-for-assessing-the-risk-to-groundwater-from-on-site-sanitation-report-no-cr-01-142)** [Accessed: 11.05.2019]

Latrine Building

This document describes how to build a squatting slab and the moulds for the frame, footrests, spacers, etc.

BRANDBERG, B. (1997): Latrine Building. A Handbook for Implementation of the Sanplat System. London: Intermediate Technology Publications

A Guide to the Development of On-site Sanitation

The publication presents appropriate technologies for sanitation and highlights socio-economic aspects of planning and implementing. Emphasis is given to household-level sanitation improvements for urban areas, as well as rural areas and small communities. Background information on sanitation, in-depth technical information on the design, construction, operation and maintenance and project planning and development processes involved in projects and programmes complement the book.

WHO (1992): A Guide to the Development of On-site Sanitation. Geneva: World Health Organisation (WHO) **URL (http://whqlibdoc.who.int/publications /1992/9241544430_eng.pdf)** [Accessed: 14.04.2010]

Pit Latrines and Their Impacts on Groundwater Quality: a systematic Review

This study reviews empirical studies on the impact of pit latrines on groundwater quality and identifies knowledge gaps regarding the potential and consequences of groundwater contamination by latrines.

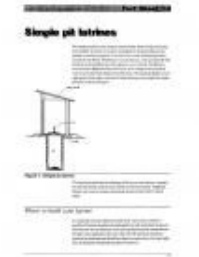
Graham, J. ; Polizotto, M.L. (2013): Pit Latrines and Their Impacts on Groundwater Quality: a systematic Review. Advance Publication. In: Environmental Health Perspectives: **URL (http://ehp.niehs.nih.gov/1206028/)** [Accessed: 09.04.2013]

Low Cost Sanitation

This survey provides information on how to calculate pit size and technology life.

PICKFORD, J. (1995): Low Cost Sanitation. A Survey of Practical Experience. London: Intermediate Technology Publications

Fact Sheets on Environmental Sanitation: Simple Pit Latrines



This factsheet contains practical information on the simple pit latrine.

ROBENS INSTITUTE (1996): Fact Sheets on Environmental Sanitation: Simple Pit Latrines. (= Fact Sheets on Environmental Sanitation). Guildford / Geneva: University of Surrey, World Health Organization (WHO). Factsheet 3.4. **URL (http://helid.digicollection.org/en/d/Js13461e/3.4.html)** [Accessed: 31.05.2019]